	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	41930	(transform or transforming or transformed or transforms or changed or changing or change or changes or convert or converting or converted or converts) same aluminum	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 08:40
2	BRS	L2	86	((aluminum adj oxide) same (aluminum adj nitride) same (aluminum adj oxynitride))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 08:40
3	BRS	L3	34	1 and 2	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 08:51
4	BRS	L4	2	3 and dielectric	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 08:52
5	BRS	L5	3	((aluminum adj oxide) and (aluminum adj nitride) and (aluminum adj oxynitride)) same dielectric	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 08:59
6	IS&R	L6	1	("5886364").PN.	USPAT	2002/08/16 09:18

	Type	L #	Hits	Search Text	DBs	Time Stamp
7	BRS	L7	1	((aluminum adj oxide) same (aluminum adj nitride) same (aluminum adj oxynitride)) same dielectric	USPAT	2002/08/16 09:20
8	BRS	L8	22	((aluminum adj oxide) and (aluminum adj nitride) and (aluminum adj oxynitride)) and dielectric	USPAT	2002/08/16 09:25
9	BRS	L9	86128	constituent	USPAT	2002/08/16 09:25
10	BRS	L10	408	9 same (aluminum adj oxide)	USPAT	2002/08/16 09:25
11	BRS	L11	30	10 same (aluminum adj nitride)	USPAT	2002/08/16 09:48
12	BRS	L12	1	(conductively adj doped adj silicon) same (first adj electrical adj node) same (silicon adj dioxide)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 09:49
13	BRS	L13	1	(conductively adj doped adj silicon) and (first adj electrical adj node) and (silicon adj dioxide)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 09:50
14	BRS	L14	59	(conductively adj doped adj silicon) and (silicon adj dioxide)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 09:51

	Type	L #	Hits	Search Text	DBs	Time Stamp
15	BRS	L15	17	(conductively adj doped adj silicon) same (silicon adj dioxide)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 10:07
16	BRS	L16	2	15 and ((aluminum adj oxide) or (aluminum adj nitride) or (aluminum adj oxynitride))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2002/08/16 10:08

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	IS&R	L1	615	(438/238).CCLS.	USPAT	2002/08/16 13:19
2	IS&R	L2	224	(438/761).CCLS.	USPAT	2002/08/16 13:20

DOCUMENT-IDENTIFIER: US 20020110330 A1

TITLE: Packaging for fiber optic device

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[0061] In the case of ion-beam assisted e-beam deposition, the chemistry of the electron beam deposited material can be altered using a reactive ion beam gas. For example, an **aluminum thin film can be transformed to an aluminum** oxide thin film using an oxygen ion source. Similarly, **aluminum can be transformed to aluminum nitride** using a nitrogen ion source. It should be understood that an argon ion source will not appreciably affect the aluminum chemistry since argon is chemically inert.

DOCUMENT-IDENTIFIER: US 20020090777 A1

TITLE: Methods of forming capacitor structures, and capacitor structures

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[0012] Finally, **aluminum nitride** can be formed by plasma nitridation of metallic aluminum. The **aluminum nitride can then be converted to aluminum** oxide, or aluminum oxynitride, by exposure of the **aluminum nitride** to an oxygen plasma.

[0030] The invention encompasses new processes for forming capacitor structures wherein low-temperature processing is utilized to form one or more of **aluminum nitride,** aluminum oxynitride, or aluminum oxide within a dielectric material between two capacitor plates. The low temperature processing comprises forming a metallic layer of **aluminum, and subsequently converting the metallic layer to one or more of aluminum nitride,** aluminum oxynitride, or aluminum oxide. For purposes of interpreting this disclosure and the claims that follow, "low temperature" processing is to be understood as processing occurring at less than or equal to 200.degree. C.

[0040] Referring next to FIG. 2, wafer fragment 10 is shown after metallic **aluminum layer 36 (FIG. 1) is exposed to conditions which convert the metallic aluminum** to a dielectric material 40. Such conditions can **convert layer 36 to one or more aluminum** oxide, aluminum oxynitride, or **aluminum nitride**. Preferably, the conditions will comprise low-temperature transformation of

material 36, with low-temperature being defined as a temperature less than or equal to 200.degree. C. Utilization of low-temperature transformation can avoid exposure of the doped regions 26 and 28, or other doped regions associated with substrate 10, to excessive temperatures which could cause undesired diffusion of dopant from the doped regions to adjacent regions.

[0041] A thickness of dielectric material 40 can be determined from a starting thickness of metallic aluminum layer 36 (FIG. 1) as well as by the type of dielectric material ultimately formed. For instance, if the dielectric material is **aluminum nitride,** then a starting thickness of metallic aluminum layer 36 of about 20 .ANG. will yield a thickness of dielectric material 40 of from about 28.5 .ANG. to about 31.5 .ANG., assuming that the metallic aluminum is entirely reacted. The metallic **aluminum of layer 36 can be converted** to dielectric material 40 by one or more of the methods described in the "Background" section of this disclosure, including, for example, exposing layer 36 to reactive RF sputtering in an ammonia/N.sub.2O mixture; reactive RF sputtering of the aluminum in a N.sub.2/O.sub.2 mixture; reactive RF sputtering of the aluminum in a O.sub.2 or a CO.sub.2 environment to form aluminum oxide; nitrogen implantation into the metallic aluminum to form **aluminum nitride**; and electron cyclotron resonance plasma-assisted chemical vapor deposition utilizing N.sub.2O/N.sub.2. An exemplary process can utilize RF nitridation to form **aluminum nitride** from the metallic aluminum. Specifically, a substrate can be maintained at a temperature of about 25.degree. C. and can be exposed to plasma for a time of from about 10 minutes to about 20 minutes. A feed gas to the plasma can comprise at least 90% ammonia (by volume)

and the remainder argon. The plasma can have a dynamic plasma pressure of about 10.sup.-2 torr, and can be maintained with a potential to an RF cathode plate of from about 300 volts to about 400 volts.

[0042] In the shown embodiment, an entirety of metallic **aluminum of layer 36 (FIG. 1) is converted** to dielectric material 40. Such dielectric material can consist essentially of, or consist of, **aluminum nitride** (AlN), aluminum oxynitride (AlON), or aluminum oxide (AlO) (with the listed compounds being described in terms of chemical constituents rather than stoichiometry). The dielectric material 40 can comprise a thickness of, for example, from greater than 0 .ANG. to less than 40 .ANG., such as, for example, a thickness of from 5 .ANG. to 15 .ANG., or a thickness of from 20 .ANG. to 40 .ANG., or a thickness of from 10 .ANG. to 20 .ANG.. The desired thickness can depend on the dielectric constant of the dielectric material 40, and on a desired capacitance of a capacitor structure ultimately formed to comprise dielectric material 40. For instance, it can be desired that the thickness of aluminum oxynitride or **aluminum nitride** be from 10 .ANG. to 20 .ANG. for a DRAM capacitor having capacitance in a 30 fF range. The relative dielectric constants of various materials are such that a layer of AlN can be twice as thick as a layer of SiO.sub.2 and have about the same capacitance. Also, a layer of AlON can be twice as thick as a layer of SiO.sub.2 and have about the same capacitance. Further, a material comprising a layer of AlON on a layer of AlN can be twice as thick as a layer of SiO.sub.2 and have about the same capacitance. Additionally, a material comprising a layer of AlN on a layer of SiO.sub.2 can be one and one-half times as thick as a

material consisting of SiO.sub.2 and have about the same capacitance.

[0046] Referring to FIG. 6, **aluminum layer 100 (FIG. 5) is converted** to a dielectric material 102. Such conversion can comprise methodology similar to that described above with reference to FIG. 2 for formation of dielectric material 40 from metallic aluminum layer 36. Accordingly, dielectric material 102 can comprise one or more of aluminum oxide, **aluminum nitride,** or aluminum oxynitride. In particular embodiments, dielectric material 40 will comprise **aluminum nitride** and dielectric material 102 will comprise aluminum oxide. The **aluminum nitride** can have a thickness of, for example, from about 10 .ANG. to about 20 .ANG., and the aluminum oxide can have a thickness of, for example, from about 10 .ANG.to about 20 .ANG..

[0052] Referring to FIG. 8, metallic **aluminum layer 36 (FIG. 7) is converted** to a dielectric material 152. Such conversion can comprise, for example,. exposing metallic aluminum layer 36 to conditions similar to those discussed above with reference to FIG. 2 to form dielectric material layer 152 to comprise one or more of **aluminum nitride,** aluminum oxide, or aluminum oxynitride. In an exemplary process, dielectric layer 152 can comprise aluminum oxynitride, and can be formed to a thickness of from about 20 to 40 .ANG., and silicon dioxide layer 150 can comprise a thickness of from about 5 .ANG. to about 15 .ANG., with a preferred thickness being about 10 .ANG.. In other exemplary processing, dielectric material 152 can consist essentially of, or consist of **aluminum nitride,** and can be formed to a thickness of, for example, from about 20 .ANG. to about 40 .ANG., and silicon dioxide 150 can be

formed to a thickness of from about 5 .ANG. to about 15 .ANG., with about 10 .ANG. being a preferred thickness.

[0054] FIG. 9 illustrates yet another embodiment of the present invention, and specifically illustrates that the methodology of FIGS. 7 and 8 can be combined with that of FIGS. 5 and 6. FIG. 9 illustrates wafer fragment 10 comprising a capacitor structure 162 which incorporates three dielectric material layers 150, 152 and 160. Dielectric material layers 150 and 152 can be formed by the processing described above with reference to FIGS. 7 and 8. Dielectric material 160 can be formed by forming a metallic **aluminum layer over dielectric material 152, and subsequently converting the metallic aluminum** layer to a dielectric material. Such can be conducted analogously to the processing described with reference to FIGS. 5 and 6 wherein a metallic **aluminum layer 100 is formed over a dielectric material 40 and subsequently converted** to a dielectric material 102. Accordingly, dielectric material 160 of FIG. 9 can comprise aluminum oxide, **aluminum nitride** or aluminum oxynitride, and in particular embodiments can consist of, or consist essentially of aluminum oxide, **aluminum nitride** or aluminum oxynitride. In particular methodology, dielectric material 150 can consist of silicon dioxide, dielectric material 152 can consist of **aluminum nitride,** and dielectric material 160 can consist of aluminum oxide. In such embodiment, silicon dioxide material 150 can have a thickness of from about S .ANG. to about **aluminum nitride** material 152 can have a thickness of from about 5 .ANG. to about 15 .ANG., and aluminum oxide material 160 can have a thickness of from about 5 .ANG. to about 15 .ANG., with exemplary thicknesses of materials 150, 152 and 160

being about 10 .ANG.
each. Dielectric materials 150, 152 and 160 can be considered to together
define a dielectric region operatively positioned between electrical nodes 34
and 42 in the capacitor construction 162 of FIG. 9.

DOCUMENT-IDENTIFIER: US 20010016404 A1

TITLE: GaN substrate including wide low - defect region for use in semiconductor element

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[0024] The **dielectric** films used as the first and second preventing means may be made of an oxide such as silicon oxide, titanium oxide, zirconium oxide, and **aluminum oxide**, or a nitride such as silicon nitride, **aluminum nitride**, and titanium nitride, or an oxynitride such as silicon oxynitride and **aluminum oxynitride**. Alternatively, the **dielectric** films may be a multilayer film made of any combination of the above films.